STRENGTH CHARACTERISTICS OF HANDY LAY-UP GFRP I-BEAMS

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Abstract

This research work mainly investigates the local production of 12 built up GFRP I-beams using Hand Lay-Up production method (since up-till now there is no pultrusion industry in Egypt). Overall strength characteristics of these beams will determined experimentally and compared to those manufactured by the Pultrusion process. This comparison will help to estimate to how extent the locally manufactured beams (by Hand Lay-Up technique) can be used in full permanent structures (like pultruded beams) or at least used in light and temporary structures. In order to achieve this goal, the experimental study was divided into two stages: The first stage is to manufacture GFRP plates using glass fibers and polyester. Two types of plates were produced one for flange plates and the other for web plates. These two types of plates are different in fibers orientation of different layers within the plate thickness in order to reach the possible higher tensile and flexural strength for flange plates and possible higher shear strength for web plates. Longitudinal and transverse tensile, compressive, and flexural strength for these two types of plates were experimentally determined using coupons tests. The second stage is to produce built-up GFRP I-beams using the aforementioned plates and composite angles. The overall stiffness and modes of failure of these beams were experimentally determined. The obtained results were compared with those of pultruded I-beams manufactured in the United States by pultrusion process. Also three different connecting methods for the 12 tested beams were investigated, namely: Bonding ï Bolting ï Bolting/Bonding connecting techniques. Of course it is expected that some local fabrication parameters (like fiber and polymer properties available in the local market, labour, temperature, polymer curing é etc) are expected to affect the properties of the fabricated beams specially that these beams are manufactured manually

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